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The association between socioeconomic status and cardiovascular risk factors among middle-aged and older men and women

Kristi Rahrig Jenkins¹ and Mary Beth Ofstedal²

¹MHealthy, University of Michigan

²Institute for Social Research, University of Michigan

Abstract

Background—Studies of gender differences in the association between socioeconomic status (SES) and cardiovascular risk factors have produced mixed findings. The purpose of this research was to examine whether the association between SES and cardiovascular risk factors differed between older men and women.

Methods—Using data on physical measures and biomarkers from the 2006 Health and Retirement Study (N=2,502 men; N=3,474 women), linear regression models were used to estimate the association between SES and seven cardiovascular risk factors. Interactions between gender and SES were tested.

Results—For all seven risks assessed, we observed significant associations of selected SES factors to cardiovascular risk for men and/or women. In all of these cases, lower SES was associated with higher cardiovascular risk. However, for six of the factors, we also observed gender differences in the association between SES and cardiovascular risk, such that lower SES was associated with higher cardiovascular risk for women but not for men. These findings suggest that the association between SES and cardiovascular risk is more pronounced for women than for men.

Implications—Implementing interventions to reduce cardiovascular risk factors, particularly among older women with lower SES, might over time reduce cardiovascular disease in women and improve quality of life.

INTRODUCTION

Cardiovascular disease is a leading cause of death and morbidity in the United States. In 2006, approximately one in three persons in the United States had one or more forms of cardiovascular disease (Lloyd-Jones et al. 2009). Over the past eight decades, cardiovascular disease has led to more deaths than any other disease (Center for Disease Control 2007). The impact of the disease has been profound for both men and women, but important gender differences exist in the disease manifestations in the two sexes. Women tend to experience the onset of cardiovascular disease roughly ten years later than men (Zhang 2010), but women have higher cardiovascular disease-related morbidity and mortality than men (Mosca et al. 2007). Given the sizable prevalence, significant impact on morbidity and mortality, and gender disparities in the disease, efforts to examine the risk factors (such as SES

characteristics) of cardiovascular disease are warranted – particularly among middle age and older adults who are at higher risk of contracting and dying from the disease. Such investigations may improve targeted interventions to reduce the impact of the disease on population health.

BACKGROUND

The General Association between SES and Cardiovascular Risk

A considerable amount of research has examined the association between SES and biometric measures of cardiovascular risk. Even though the association between SES and cardiovascular risk is not uniform, and it differs by the specific measure of SES (e.g. education, income, etc.) and cardiovascular risk (BMI, cholesterol, etc.) being examined, the general finding has been that lower SES is associated with greater cardiovascular risk (Gupta et al. 2012, Tiessen et al. 2012, Gaillard et al. 1997). For example, Metcalf, Scragg, and Davis found that persons with lower SES had higher waist to hip ratios and a higher Body Mass Index (BMI) (2007).

SES, Cardiovascular Risk and Gender

Numerous studies have suggested that the association between SES and cardiovascular risk differs for men and women, although findings have been mixed with respect to the nature of the difference. Some research has suggested an association between lower SES and greater cardiovascular risk for women but no such association for men. For example, Chichlowska et al. (2008) examined US adults aged 45–64 years of age in the Atherosclerosis Risk in Communities Study to explore the relationship between individual (i.e. family income, years of education) and neighborhood (e.g. measured based on the 1990 Census) SES and metabolic syndrome (ATP III criteria). They found no socioeconomic relationships with metabolic syndrome in men, but women were more likely to have metabolic syndrome if they had low and moderate (compared to high) levels of individual socioeconomic characteristics. Similarly, Santos, Ebrahim, & Barros (2008) examined current occupation, years of education, and social class as correlates of metabolic syndrome (ATP III definition) among Portuguese adults aged 40 years and older. They found no association between socioeconomic characteristics and metabolic syndrome for men; however, among women, those with lower levels of education and less favorable occupations had greater odds of metabolic syndrome than those with higher education and more favorable occupations. Other studies found similar results (Loucks et al. 2007; Zhan, Yu, Chen, Gao, Ding, Fu, Zhang and Hu, 2012; Park, Yun, Lee, Cho and Park, 2007; Stringhini, Spencer, Marques-Vidal, Waeber, Vollenweider and Paccaud, 2012).

Other studies on cardiovascular risk factors have found support for an association between lower SES and increased risk of cardiovascular disease for both men and women, but the association was stronger for women than men. Using data from the Australian Diabetes, Obesity, and Lifestyle (AusDiab) study, Kavanagh et al. (2010) found that among working age men and women (25–64 years old), lower SES (compared to high SES) was associated with a poorer biometric profile for cardiovascular risk for women compared to men. In contrast, other work has found some evidence that lower SES is associated with greater

cardiovascular risk for men compared to women for specific risk indicators. A study based in a region in Greece found an inverse association between body mass index, waist-to-hip ratio and SES in men, and no such association in women (Panagiotakos et al. 2005).

Several theories have been suggested to explain why adult SES may have a stronger association with cardiovascular risk factors for women than men. First, at any level of income women may use their resources differently than men. Women may choose to invest more in their health by purchasing healthier (potentially more expensive) foods or fitness equipment. In contrast, men may be more likely to purchase other items less directly related to their health (Broom 2008). Second, a greater stigma is associated with being obese for women than men. Thus, obesity may limit women's socioeconomic standing more than men's (Finkelstein, Ruhm, and Kosa 2005). Third, women with lower educational attainment may be more likely than men with lower levels of education to end up in social and familial situations (e.g., single parenting) that contribute to greater cardiovascular risk (Loucks et al. 2006; Thurston et al. 2005).

SES, Cardiovascular Incidence and Gender

Although the literature is mixed in this area, SES differences in cardiovascular disease incidence may be stronger among women than men due to the association between the timing of menopause and SES. Women with lower SES tend to experience menopause earlier in life (Velez, Alvarado, Lord and Zunzunequi 2010; Lawlor, Ebrahim, and Smith 2003). It is plausible that the early onset of menopause may change the body's composition (Ghosh and Bhagat 2010) and in turn lend itself to a longer exposure period at a heightened risk state, contributing to an earlier onset of cardiovascular disease. Given that men do not have a similar biological pathway, such SES differences in cardiovascular disease incidence may be minimized.

Importance of Health Behaviors in the Association between SES and Cardiovascular Risk

Substantial literature has linked SES with health behaviors which are, in turn, related to cardiovascular risks. Lower SES has been associated with engagement in a variety of behaviors that are detrimental to health, including smoking (Hiscock et al. 2012), being less physically active (Pampel, Krueger and Denney 2010; National Center for Health Statistics 2008) and more problematic patterns of alcohol consumption (Keyes & Hasin 2008; Grittner et al. 2012). Various mechanisms have been suggested for these findings (Pampel, Kruegger & Denny 2010). One such mechanism is that lower SES may be associated with having less hope for the future and, as a result, with health behaviors that tend toward immediate rather than long-term gratification (Cutler and Lleras-Muney 2008). Second, lower SES environments may be particularly emotionally draining and overeating, smoking and being more sedentary may generally be more pleasurable behaviors that provide a way to cope (Lantz, House & Mero 2005, Layte and Whelan 2009). This makes changes toward healthier behaviors, when living in such environments, more challenging. Third, because lower SES environments are more likely to pose greater health risks (e.g. pollution, higher crime, more occupational exposures) for the residents, the perception may be that change toward positive health behaviors will have little impact on overall health (Niederdeppe et al. 2008; Lawlor et al. 2003).

The present investigation—These analyses explored a specific area of health among middle-aged and older adults that has had mixed findings in the literature, namely gender differences in the association between SES and cardiovascular risk factors. We drew on physical and biomarker measures to assess cardiovascular risk. Our main objective was to determine if the association between lower SES and increased cardiovascular risk factors differed between men and women. We hypothesized that SES would be more strongly associated with cardiovascular risk for women compared to men.

This present study contributes to the literature via several strengths. First, these data were from a nationally representative sample of middle age and older adults in whom cardiovascular risk is higher than in younger adults. An additional strength was that the dataset included a robust set of measures of SES. Associations of SES with cardiovascular risk factors may differ, in part, depending on the SES construct being examined. By the inclusion of several different measures (i.e. assets, income and education), this study allowed for the assessment of differences in SES constructs. Lastly, the physical measure and biomarker assessments were measured and not self-reported, thus providing greater confidence in those measures.

METHODS

Data

The data used in this study were from the 2006 wave of the Health and Retirement Study (HRS), a population-based, longitudinal survey of adults aged 51 years and older in the United States. The survey was sponsored by the National Institute on Aging and conducted by the Survey Research Center at the University of Michigan. The HRS was designed to study health transitions among middle age and older adults and their impact on individuals, families, and society. The HRS has conducted biennial interviews with respondents and their spouses. When the eligible respondent was unable to be interviewed, often due to medical and/or cognitive problems, a proxy, frequently the spouse, was enlisted to answer questions for that respondent.

The HRS is an on-going study that uses a multi-stage area probability sample design to select participants. The respondent sample is refreshed every six years (e.g., 2004, 2010) by adding a new cohort of adults aged 51 to 56 years old. This enables the HRS to maintain its population-based representation of middle-aged and older adults across waves. In its 2006 wave, the HRS was nationally representative of adults aged 53 years and older. The baseline response rate ranged from 82% for the original HRS cohort (entered in 1992) to 69% for the Early Baby Boom cohort (entered in 2004); the average response rate across all cohorts was 78%. Response rates at each follow-up wave have remained very steady over time, between 88% and 89%. More detailed information on the technical aspects of the sample design, sample sizes and response rates is available in the technical reports found on the HRS website: Heeringa and Connor, 1995 (for sample design information) and HRS, 2011 (for response rate information).

In 2006, the HRS launched an enhanced face-to-face interview as an expansion of the biennial core interview. The enhanced face-to-face interview was comprised of a set of

physical performance measurements (walking speed, balance measures, grip strength, peak flow), anthropometric measurements (height, weight, waist circumference), systolic and diastolic blood pressure measurements, collection of dried blood spots for laboratory tests, collection of saliva for genetic testing, and a self-administered questionnaire on psychosocial topics. The enhanced face-to-face interview was administered to a randomly-selected half of the HRS respondent sample in 2006; the other half of the HRS sample underwent the enhanced interview in 2008. The HRS has repeated the enhanced interview on an every-other-wave basis thereafter. Because the HRS is a mixed-mode study (telephone and face-to-face), verbal (as opposed to written) consent was obtained from respondents for participation in the interview. However, respondents in the enhanced face-to-face sample were required to provide written consent for each of the three main components of the enhanced interview (i.e., one for the physical performance, anthropometric and blood pressure measurements, a second for the blood sample and a third for the saliva sample). The enhanced interview was not administered to respondents residing in long-stay nursing facilities nor to respondents requiring a proxy interview.

The HRS was approved by the Health Sciences Institutional Review Board at the University of Michigan. These data used for these analyses are publicly available and contain no unique identifiers, thus assuring respondent anonymity.

Study Population

A total of 18,469 respondents were interviewed in the 2006 wave core survey. Of those, 7,794 consented to the anthropometric and blood pressure measurement portion (93% of the eligible sample); 6,941 consented to the dried blood spot portion (83% of eligibles), and 6,747 respondents provided a blood sample. Once consented, respondents could opt out of one or more anthropometric and blood pressure measurements; likewise, not all blood spots yielded a valid laboratory result. Thus, the individual anthropometric and blood pressure measures and the individual laboratory tests each had unique respondent sample sizes. We also excluded respondents who were not age-eligible (i.e., born after 1953) and those with missing values on the independent variables. After these exclusions, the number of respondents who had non-missing data on one or more of the physical and/or laboratory measurements examined in this paper was 5,976, including 2,502 male and 3,474 female respondents.

Variables and Their Measurement

Cardiovascular Risk Factors: The dependent variables for the analysis included seven cardiovascular risk factors: body mass index (BMI), waist circumference, systolic blood pressure, diastolic blood pressure, high density lipoprotein (HDL) cholesterol, the ratio of total to HDL cholesterol, and hemoglobin A1c. These risk factors were based on measured indicators obtained from the enhanced face-to-face interview. Prior to administering each measure, interviewers asked respondents if they understood the procedure and thought it was safe to proceed. Only those who responded affirmatively continued with the collection. In addition, during the administration of the physical measures and biomarkers portion of the interview, respondents were asked to refrain from any behavior that might affect data collection (e.g. eating, chewing gum, etc.). More detailed information on the protocols used

to assess these indicators is provided in documentation reports that are available on the HRS website: <http://hrsonline.isr.umich.edu/> (Crimmins et al. 2009; Crimmins et al. 2008).

Anthropometric and Blood Pressure Measures—Body mass index was derived from measured height and measured weight. Waist circumference was measured at navel level while the person was at the end of an exhalation. Blood pressure included systolic and diastolic measures. An automated sphygmomanometer was used to measure intra-arterial blood pressure. The average of three measures for each of systolic and diastolic blood pressure was calculated and used in these analyses. Self-report of medication use for high blood pressure was included as a control variable in the multivariate models assessing systolic and diastolic blood pressure.

Laboratory Measures—The dried blood spots were assayed for hemoglobin A1c (HbA1c), total cholesterol, and HDL. As indicators of cardiovascular risk, we used continuous measures of HbA1c, HDL cholesterol, and the ratio of total to HDL cholesterol. Self-report of medication use for diabetes was included as a control variable in the multivariate model assessing HbA1c as a dependent variable. Likewise, self-report of medication use for high cholesterol was included as a control in the multivariate models of HDL and the ratio of total to HDL cholesterol.

Sociodemographic Characteristics: Sociodemographic control variables included age, race/ethnicity and couple status. To allow for a non-linear effect of age, we used a categorical measure with the following age groups: 53–59, 60–69, 70–79, and 80+ years (reference=53–59). Race and ethnicity were combined into the following categories: Non-Hispanic White, African-American or Hispanic (reference=White). Because of small numbers, respondents who classified themselves as “other” race were dropped from these analyses. Couple status (married or living with a partner vs. not married or living with a partner; reference=not married/partnered) was also included in the models. These measures were coded similarly as in other research (Jenkins and Fultz 2008).

Measures of Socioeconomic Status: The SES measures included were common constructs used to examine SES differences in cardiovascular risk (Braveman et al. 2005). A continuous measure of years of educational attainment, log annual household income and log household assets were the SES measures used in these analyses. Income was measured as total household income of the respondent and spouse and summed income from: unemployment and workers compensation, SSI and Social Security disability, pensions and annuities, Social Security retirement, other government transfers, household capital income, and other income. Assets was defined as the net value of total wealth (excluding second home) and was calculated as the sum of all assets except second home minus the sum of all debt except mortgage on a second home.

STATISTICAL ANALYSIS

The analytic design included both basic descriptive analyses and more complex multivariate techniques. Two sets of bivariate analyses were presented. The first showed basic descriptive statistics by gender. The second showed the means and standard deviations for each measure

of cardiovascular risk, also by gender. For these analyses, we used chi-square tests to assess gender differences in the categorical variables and bivariate regressions for the continuous variables.

The multivariate analyses used multiple linear regression (ordinary least squares) to produce unstandardized estimates for the associations of sociodemographic factors, SES and health behaviors with each of the seven cardiovascular risk factors assessed. The selection of independent variables was theoretically based and informed by our review of previous studies (see Background and Variables and Their Measurement sections for more information). All variables were retained in the model, regardless of whether they were statistically significant. Model fit was assessed for the multivariate models using the R-square comparing intercept only and intercept with covariates for each cardiovascular risk outcome. The R-squared coefficients in the final models ranged from 0.04 – 0.32, with waist (males) having the smallest coefficient and HbA1c (females) having the largest.

To evaluate gender differences in the association between SES and the cardiovascular risk factors, we first ran gender stratified models to determine which SES characteristics were associated with each cardiovascular risk factor for men and women. Based on those results, we then combined men and women and reran the models to test for interactions between SES factors and gender. Interactions were tested for SES characteristics that showed different associations for men vs. women for a given outcome, for example, if the association was statistically significant for women and not for men or vice versa, or if the associations were statistically significant for both but substantially different in magnitude. For ease of interpretation, we chose to present results from the gender-stratified models here (Tables 3–5).

As noted above, the analytic sample varied across outcomes and included respondents with non-missing data on each specific cardiovascular risk factor. To adjust for the complex sample design of the HRS, the differential probability of selection and non-response, all analyses were weighted, and standard errors were adjusted using the survey procedures in the statistical package SAS (Release 9.2). The overall 2006 sample, the physical measures sample, and the biomarker (blood) sample each had their own respondent weights. We used the biomarker weight for analyses of A1c, Total/HDL ratio and HDL and the physical measures weight for analyses of systolic and diastolic blood pressure, waist circumference, and BMI.

A study by Sakshaug et al. (2010) examined factors associated with consent to the physical measures and biomarkers in the 2006 HRS. Older individuals and those with more functional limitations were less likely to consent to the physical measures and biomarkers, whereas Hispanic persons, those who were more highly educated, coupled, and had diabetes were more likely to consent. The HRS physical measures and biomarker weights adjust for these sociodemographic and health differences.

RESULTS

Compared to women, men tended to be younger, less racially and ethnically diverse and much more likely to be married or coupled (Table 1). Women were more likely than men to report taking medication for high blood pressure, but medication use for both cholesterol and diabetes was reported by more men than women. Regarding SES, men and women differed fairly substantially. In particular, men had higher mean levels of education, household income, and household assets than women. In addition, men were more likely than women to smoke currently. Men more than women reported consuming four or more drinks on one occasion. Men also had a higher average frequency of participating in moderate exercise than women. All of these differences were statistically significant at $p < .05$.

The means for total/HDL cholesterol ratio, waist circumference, systolic blood pressure, and diastolic blood pressure were higher for men than for women (Table 2). In contrast, the mean for HDL cholesterol was higher for women than men. All of these associations were statistically significant at $p < .01$. Mean values for hemoglobin A1c and BMI did not differ statistically between men and women.

As noted previously, we controlled for demographic factors, medication use (where relevant), and health behaviors in multivariate regression models.

At least one of the three indicators of socioeconomic status was significantly associated with all of the cardiovascular risk factors examined, and for several of the outcomes, multiple SES indicators were significantly associated. Education and assets tended to show the strongest and most consistent associations.

For most SES indicators and outcomes examined, the associations between SES and cardiovascular risk were stronger for women than for men. For example both education and assets were negatively associated with the ratio of total to HDL cholesterol for women, whereas these associations were not statistically significant for men (Table 3). Likewise, both income and assets were positively associated with HDL cholesterol for women, and not significantly associated for men (Table 3). Additionally, although education was negatively associated with BMI for both women and men (Table 4), interaction results suggested that the association was significantly stronger for women than men. Assets were also negatively associated with BMI for women, and both education and assets were negatively associated with waist circumference for women (Table 4). For men, the associations for each were also negative, but not statistically significant. Lastly, education was negatively associated with both systolic and diastolic blood pressure for women (Table 5). For men, the associations were also negative, but not statistically significant.

In one instance, the associations between SES and cardiovascular risk were similar for men and women. Education was positively associated with HDL cholesterol for both men and women (Table 3). Although the coefficient was nearly twice as large for women vs. men, the difference (as tested in the interaction model) was not statistically significant.

Finally, two SES indicators had associations with cardiovascular risk that were statistically significant for men but not for women. Among men, income was negatively associated with

the ratio of total to HDL cholesterol (Table 3), and assets were negatively associated with hemoglobin A1c (Table 5). For women these associations were also negative, but not statistically significant. However, in the models that tested interactions, the gender differences in these associations were not statistically significant.

DISCUSSION

Given the rapidly growing aging population in the U.S. and the increasing costs of health care, more effective targeting of populations at risk for disease is an essential part of both improving the quality of life for middle-age and older adults and reducing overall health care costs. Identifying subgroups that are likely to be at higher risk for cardiovascular disease, for example women with lower levels of assets, may be a first step in developing targeted health care interventions.

Although the scientific evidence is mixed in this area, some studies have found that the association between SES and certain cardiovascular risk factors was more pronounced for men than for women (Panagiotakos et al., 2005), while others have suggested that the association between SES and cardiovascular risk was greater for women than men (Loucks et al. 2007; Sorel et al. 1992; Myllykangas et al. 1995). In this study, we hypothesized that the association between lower SES and increased cardiovascular risk would be more pronounced for women than men. The results provided support for our hypothesis. Specifically, for six of the seven outcomes examined, lower SES (assets and/or education) was significantly associated with higher risk levels for women but not for men. Furthermore, we did not find any evidence (at least for the SES indicators or cardiovascular risk outcomes that we examined) that the association between SES and cardiovascular risk was significantly higher for men than for women. This was consistent with other findings (Zhan, Yu, Chen, Gao, Ding, Fu, Zhang and Hu, 2012).

In this study, patterns of SES by gender seemed to be associated in particular with anthropometric assessments (i.e. BMI and waist circumference) and lipids (HDL and total/HDL cholesterol ratio). Given that education was the only factor related to blood pressure (and only for women not for men), gender differences in the SES associations were less pronounced for blood pressure than for the other outcomes (e.g. lipids and anthropometric measures). This may be due to gender-specific pathways. With regard to the anthropometric measurements, social norms may have contributed to the greater SES disparity among women that was observed. Among women, higher levels of education have been associated with lower BMI (Stringhini, Spencer, Marques-Vidal, Waeber, Vollenweider and Paccaud, 2012). Greater social pressure may occur among women from higher compared to lower SES to maintain a lower BMI (McLaren, 2007). This social norm is likely less strong for men (Jenkins, Fonda, Fultz and Wray, 2003). Gender-specific biological pathways associated with lipid levels (Maric, 2005), as well as evidence that suggests that lower SES is associated with poorer nutrition and less physical activity (Stringhini, Spencer, Marques-Vidal, Waeber, Vollenweider and Paccaud, 2012), may also contribute to gender-specific differences in SES and lipid associations.

Across the three SES characteristics assessed, women compared to men had lower education, income and assets. Having a lower level of SES across all three constructs, rather than one (e.g., income), may have an additive association with cardiovascular risk factors. The combined phenomena of several lower SES characteristics, among women compared to men, creating an even greater disadvantage with cardiovascular risks, has been suggested in other studies (Loucks, Rehkopf, Thurston, and Kawachi, 2007).

Several limitations should be considered when interpreting these findings. First, our analysis was cross-sectional, and thus we could not establish temporal order or causality among the variables. Based on these results, however, in which socioeconomic and demographic characteristics and cardiovascular risk factors were clearly correlated, it is reasonable to assert that socioeconomic characteristics and cardiovascular risk factors may affect each other, although the temporal direction is unclear based on cross-sectional analyses. For example, having lower levels of assets or education may contribute to lower HDL cholesterol, but lower HDL cholesterol could contribute to lower assets or education. A related limitation was that the association between SES and cardiovascular risk was likely a process that developed over a long period of time. In this study, we examined the effect of current SES on cardiovascular risk, without regard to SES at prior stages of life.

Second, healthier individuals overall, but particularly healthier Hispanic and African American older adults, were likely to be over-represented in this analytic sample of adults, because of racial/ethnic disparities in morbidity and mortality. Because Hispanic and African American older adults have higher morbidity and mortality rates (from various diseases) than non-Hispanic Caucasians (Buka 2002; Schulz et al. 2002), in this sample the non-Caucasian groups of respondents with lower SES may be particularly healthy and robust to have reached to these middle and older ages. The implication of this would be that any association found between socioeconomic characteristics, particularly among these Hispanic and African American adults, and cardiovascular risk factors was likely to be a conservative estimate.

Third, the older age range of the sample also has implications for the results, particularly with regard to gender differences in the association between SES and cardiovascular risk. For example, educational differences between men and women are more pronounced in older cohorts; specifically, in earlier generations, men had higher levels of education than women (Alemán & Marine 2007; McGlynn 2007). The strength of the gender differences in the association between SES and cardiovascular risk, particularly in regard to education, may thus be stronger among older versus younger cohorts. Another example is that among middle age and older adults compared to younger age groups lower income and assets (in particular) likely represented long-term exposure to deprivation. Given this, these middle age and older adults with lower SES in our sample may have been particularly robust, with longer exposure to deprivation and, in turn, the SES association with cardiovascular risk may be conservative.

Fourth, assets and education seemed to be the two SES characteristics that had the strongest association with cardiovascular risk. These two SES characteristics may have shown stronger associations with cardiovascular risk factors because of how they were defined. For

example, because the income variable was not adjusted for family size, the association of income with cardiovascular risk factors may have been masked. Also, this definition of income is particularly interesting among this sample of middle age and older adults because it included working adults, with a more dynamic income state, as well as retirees with more fixed incomes. This dynamic versus fixed aspect of income may also have influenced associations with cardiovascular risk.

These findings suggested other interesting areas for future study. Race and ethnicity had a statistically significant association with cardiovascular risk in six of the seven models for women and in three of the seven models for men. Further investigations of racial disparities in cardiovascular risk may lead to more efficient targeting of health interventions. Another interesting area would be to explore whether the association between SES and cardiovascular risk differs for younger compared to older individuals. Cohort differences in education may produce differential effects and shed more insight into such associations.

The interpretation and resultant implications of these findings are important for developing interventions for cardiovascular disease. Exploring interventions that might reduce cardiovascular risk factors, particularly among at risk groups such as women with lower SES, might over time reduce the prevalence of cardiovascular disease and potentially improve quality of life at a population level.

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Table 1

Characteristics of Study Participants by Gender

	Female N=3474	Male N=2502	
	%	%	Significance
Age (years)			
50–59	37.11	38.92	
60–69	28.76	31.86	***
70–79	20.75	19.38	
80–89	13.39	9.85	
Race/Ethnicity			
White	82.58	85.15	
African American	9.74	7.55	**
Hispanic	7.68	7.30	
Coupled Status			
Married/Coupled	58.39	80.57	***
Unmarried/Not coupled	41.61	19.43	
Currently on HBP Medication			
No	50.97	55.18	*
Yes	49.03	44.82	
Currently on Cholesterol Medication			
No	66.11	58.90	***
Yes	33.89	41.10	
Currently on Diabetes Medication			
No	85.52	82.79	*
Yes	14.48	17.21	
Education (years)	12.70 (0.09)	13.16 (0.08)	
Mean (SD)			***
Income	62,771	94,641	
Mean dollars (SD)	(2,204)	(13,463)	***
Assets	504,355	627,041	
Mean dollars (SD)	(48,801)	(58,900)	***
Number of times consumed four or more drinks one occasion	0.41 (0.08)	3.09 (0.29)	***
Mean (SD)			
Frequency of moderate exercise (1=hardly ever or never to 5=every day)	3.15 (0.03)	3.39 (0.03)	***
Mean (SD)			
Currently smokes			
No	86.74	83.81	

	Female N=3474	Male N=2502	
	%	%	Significance
Yes	13.26	16.19	**
N	3,474	2,502	
%	58.13	41.87	

Notes: Results are weighted and adjusted for the complex survey design.

Table 2

Means and Standard Deviations for Cardiovascular Risk Factors by Gender

Risk Factor	Female Mean (SD)	Male Mean (SD)	Significance
Total/HDL Cholesterolratio	3.46 (0.02)	3.93 (0.03)	***
HDL Cholesterol	61.45 (0.38)	51.84 (0.36)	***
Waist Circumference	38.29 (0.15)	41.64 (0.14)	***
Body Mass Index	29.34 (0.15)	29.30 (0.13)	-
Systolic Blood Pressure	128.77 (0.42)	133.11 (0.44)	***
Diastolic Blood Pressure	79.50 (0.25)	80.61 (0.28)	**
Hemoglobin A1c	5.81 (0.02)	5.81 (0.02)	-

Notes: Results are weighted and adjusted for the complex survey design.

Table 3

Estimated Regression Coefficients for the Effects of Socioeconomic Status, Demographic s, and Health Behaviors on Total/HDL Cholesterol Ratio and HDL Cholesterol for Middle Age and Older Adults

	Ratio Total/HDL Cholesterol (N=4,535)	HDL Cholesterol (N=4,538)
Sex		
Female	Ref.	Ref.
Male	0.28*	−6.77***
Age		
50–59	Ref.	Ref.
60–69	−0.01	−1.0
70–79	−0.09	−0.75
80+	−0.29***	−0.74
Race/Ethnicity		
White	Ref.	Ref.
Black American	−0.23**	2.25**
Latino	0.03	−1.22
Coupled Status		
Married/Coupled	Ref.	Ref.
Not Married/Coupled	0.05	−0.06
Currently on Cholesterol Medication	−0.32***	−2.15***
Number of Years in School	−0.02***	0.37***
Income (logged)	−0.04*	0.41*
Assets (logged)	−0.01*	0.30**
Male x Assets	0.02*	−0.34*
Number of times consumed four or more drinks one occasion	−0.01*	0.22***
Frequency of moderate exercise (1=hardly ever or never to 5=every day)	−0.07***	0.95***
Currently smokes	0.11	−1.98**
R-square	0.18	0.17

Note: Results are weighted and adjusted for the complex survey design.

Table 4

Estimated Regression Coefficients for the Effects of Socioeconomic Status, Demographics, and Health Behaviors on Waist and Body Mass Index for Middle Age and Older Adults

	Waist (N=5,818)	BMI (N=5,640)
Sex		
Female	Ref.	Ref.
Male	−0.62	−1.87**
Age		
50–59	Ref.	Ref.
60–69	0.38	−0.29
70–79	−0.38	−1.66***
80+	−2.08***	−4.11***
Race/Ethnicity		
White	Ref.	Ref.
Black American	0.56	1.02***
Latino	−0.48	−0.37
Coupled Status		
Married/Coupled	Ref.	Ref.
Not Married/Coupled	−0.18	0.25
Number of Years in School	−0.22***	−0.12**
Male x Number of Years in School	0.18**	N/A
Income (logged)	−0.11	−0.13
Assets (logged)	−0.21***	−0.22***
Male x Assets	0.18***	0.19***
Number of times consumed four or more drinks one occasion	−0.02*	−0.03***
Frequency of moderate exercise (1=hardly ever or never to 5=every day)	−0.94***	−0.67***
Currently smokes	−2.17***	−3.18***
R-Square	0.16	0.11

Note: Results are weighted and adjusted for the complex survey design.

Table 5

Estimated Regression Coefficients for the Effects of Socioeconomic Status, Demographics, and Health Behaviors on Systolic and Diastolic Blood Pressure and Hemoglobin A1c for Middle Age and Older Adults

	Systolic (N=5,723)	Diastolic (N=5,704)	Hemoglobin A1c (N=5,872)
Sex			
Female	Ref.	Ref.	Ref.
Male	−1.10	1.01**	0.01
Age			
50–59	Ref.	Ref.	Ref.
60–69	4.97***	−0.52	0.01
70–79	7.64***	−3.30***	0.06
80+	11.5***	−4.67***	0.06
Race/Ethnicity			
White	Ref.	Ref.	Ref.
Black American	6.14***	2.74**	0.19***
Latino	1.97	0.23	0.23*
Coupled Status			
Married/Coupled	Ref.	Ref.	Ref.
Not Married/Coupled	−0.65	−0.76	0.01
Currently on Medication^I			
No	Ref.	Ref.	Ref.
Yes	5.06***	1.74***	1.21***
Number of Years in School	−0.66***	−0.10	0.01
Male x Number of Years in School	0.48**	N/A	N/A
Income (logged)	0.01	0.17	−0.03*
Assets (logged)	−0.11	−0.05	−0.01*
Number of times consumed four or more drinks one occasion	0.11**	0.08**	−0.01
Frequency of moderate exercise (1=hardly ever or never to 5=every day)	−0.13	−0.07	−0.03**
Currently smokes	1.05	0.19	−0.04
R-Square	0.10	0.04	0.31

Notes: Results are weighted and adjusted for the complex survey design.

^IFor models predicting systolic and diastolic blood pressure, this measure pertains to blood pressure medication. For model predicting A1c, the measure pertains to diabetes medications.